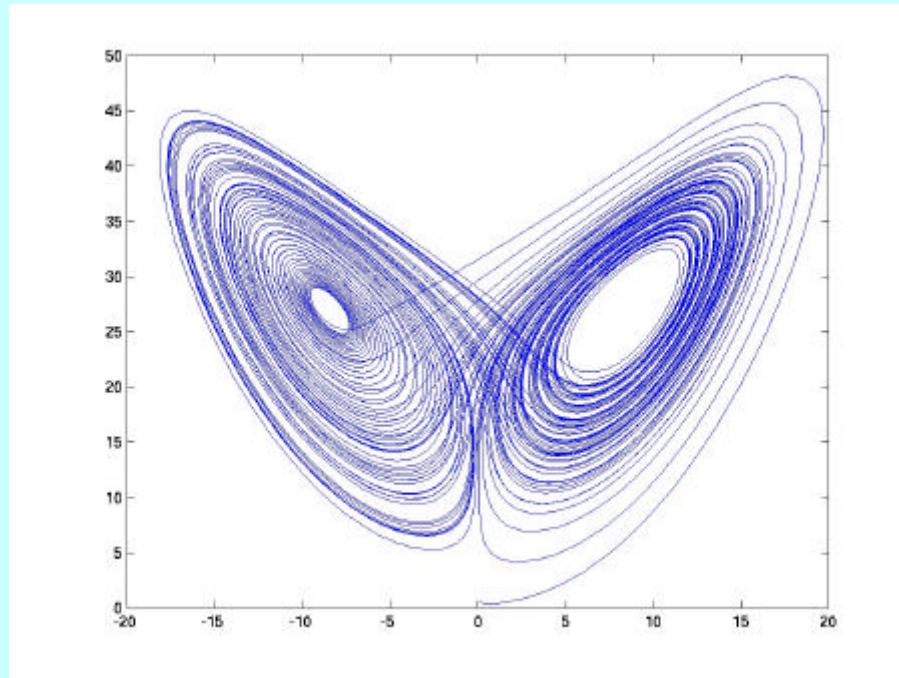


# Lorenz equations: Sequential DA

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# Lorenz equations: Sequential DA

You will use the program *lorenz\_menu* in the directory *sequential*.

You can experiment with four different sequential DA schemes

- Successive correction
- Analysis correction
- Optimal interpolation
- Kalman filter

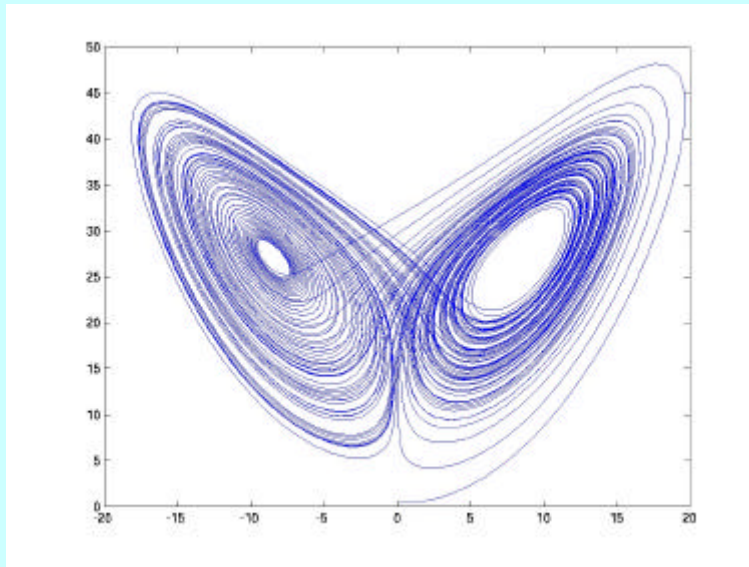


# You can choose various parameters:

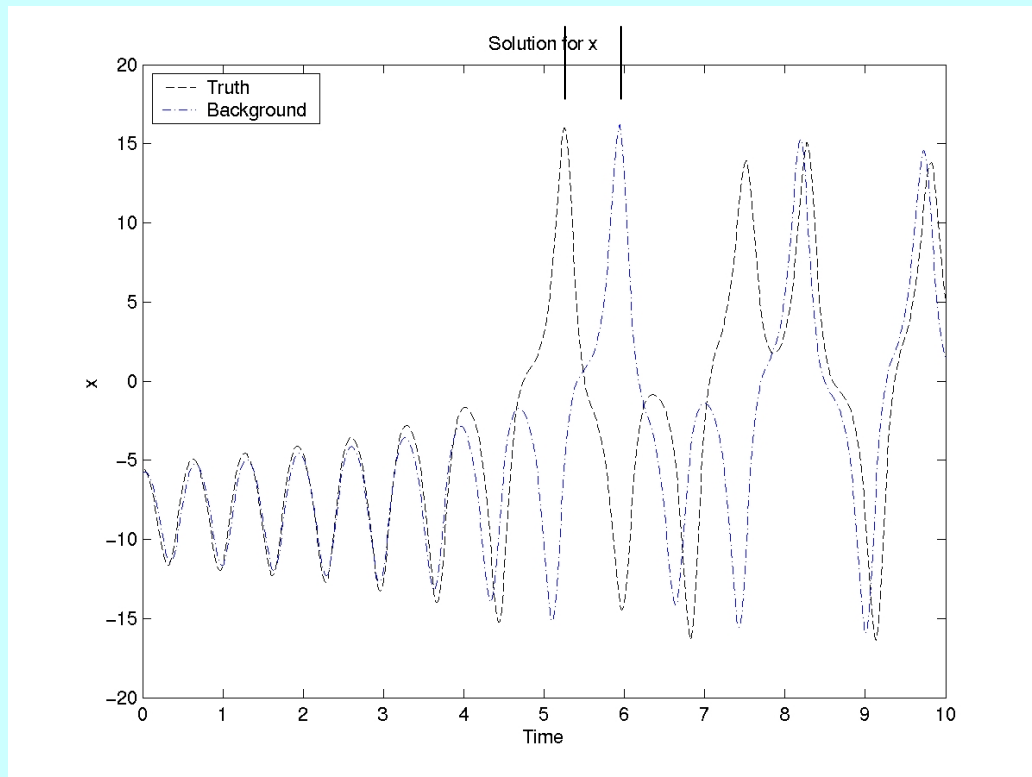
- Iterations
- Correct/ incorrect covariance matrices
- Frequency of observations
- Noise on observations



You are provided with a case in which the change in regime in the background occurs later than in the truth

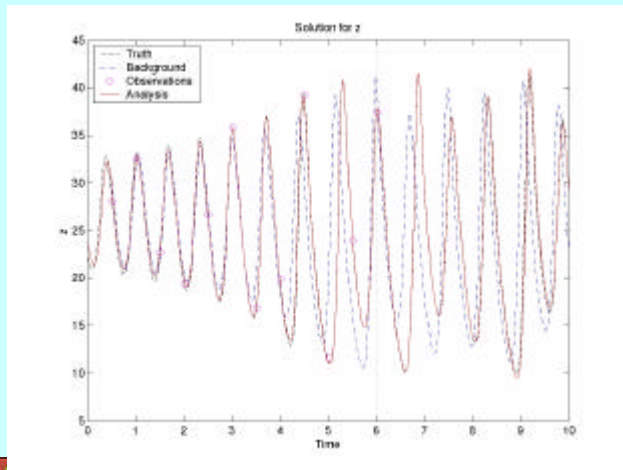
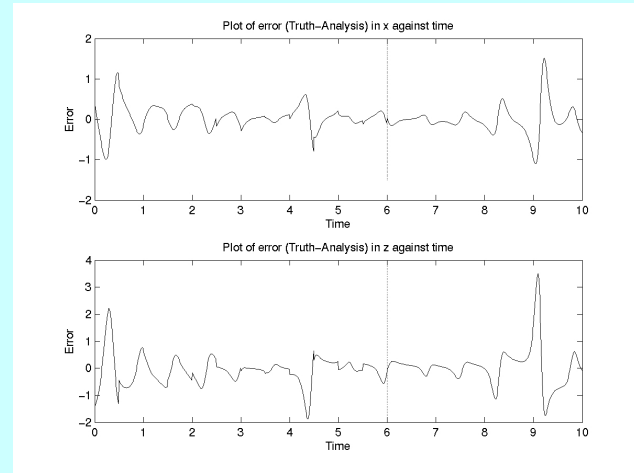
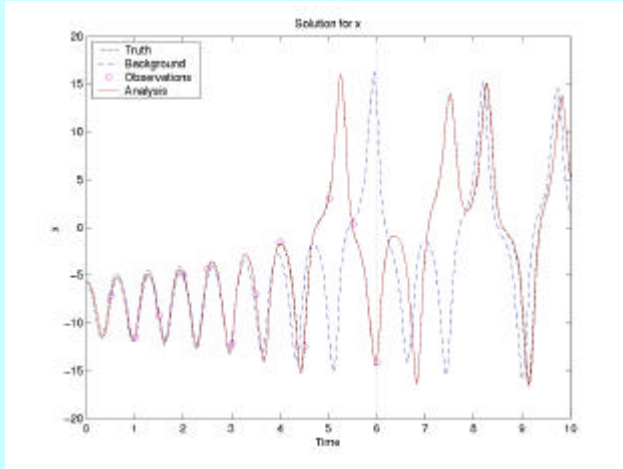


# Truth and background conditions



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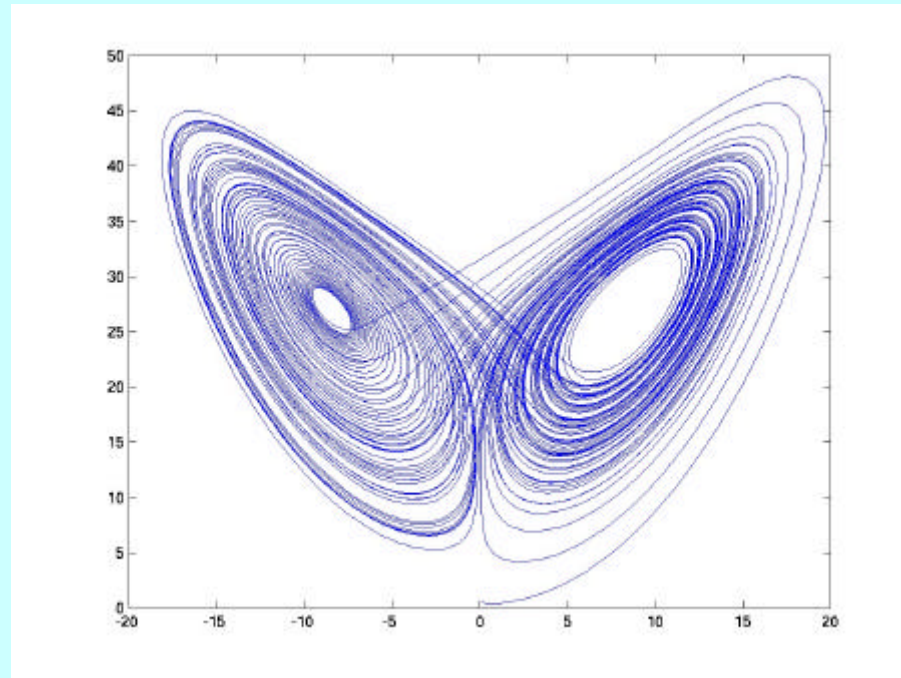


**List of options chosen**

Analysis scheme: Successive correction  
 Number of iterations: 1  
 Time steps between observations: 50  
 Observations have random noise with variance 0.1  
 Noise generated in program and saved to file

# Lorenz equations: 4D-Var

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# Lorenz equations: 4D-Var

In the directory *var* you have various programs related to 4D-Var.

The first set of exercises allow you to understand how a 4D-Var system is tested, by running tests of

- Tangent linear model
- Adjoint model
- Gradient of cost function





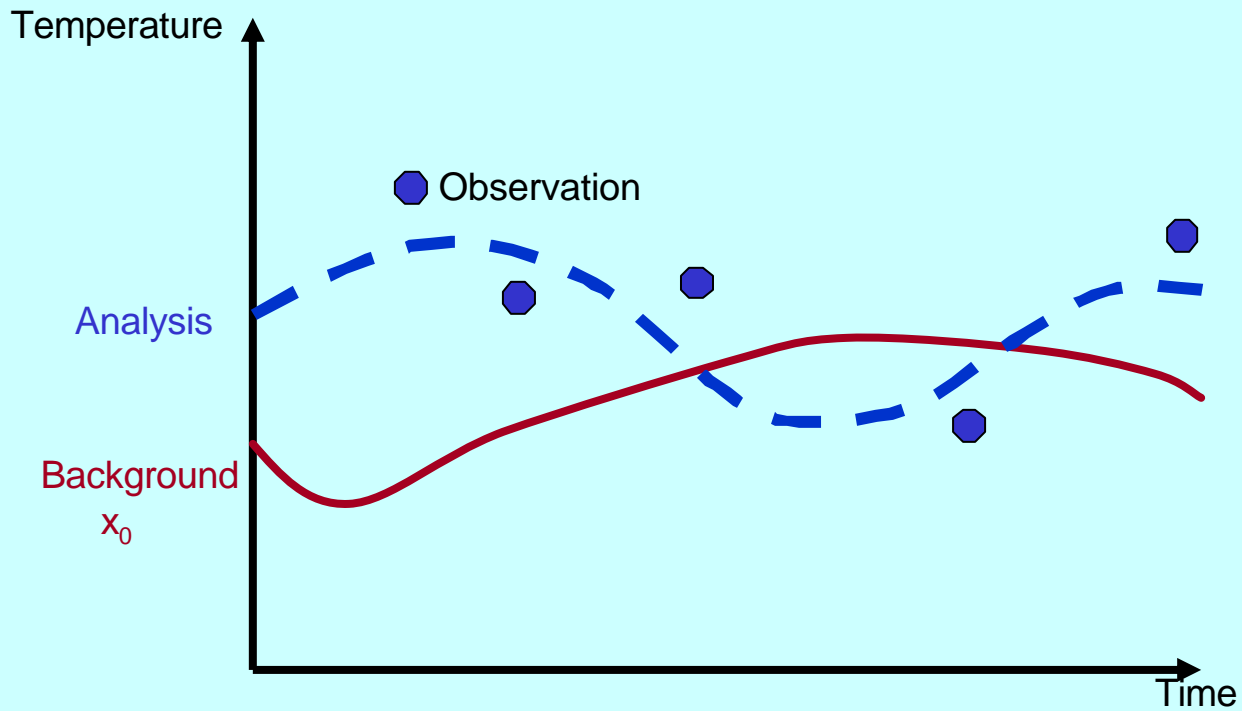
You can then run two types of 4D-Var

- Full 4D-Var
- Incremental 4D-Var

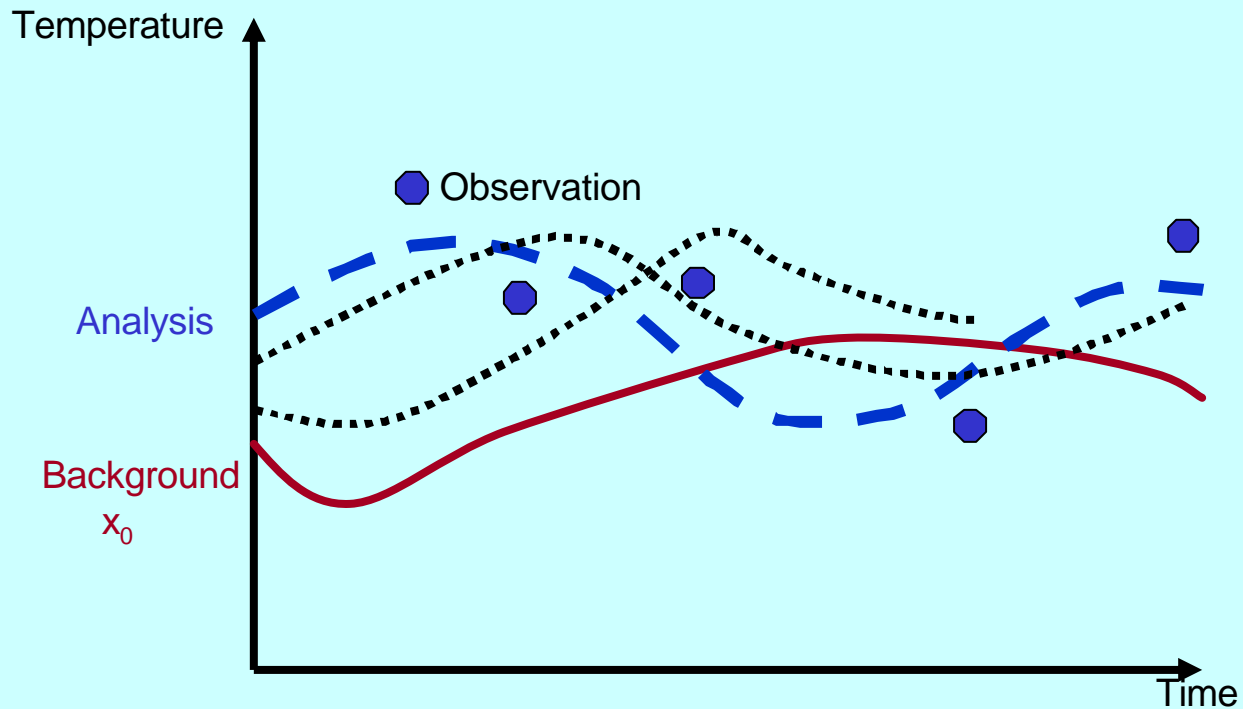
Start by using the parameters in the documentation and then try changing them to see the effect on the analysis.



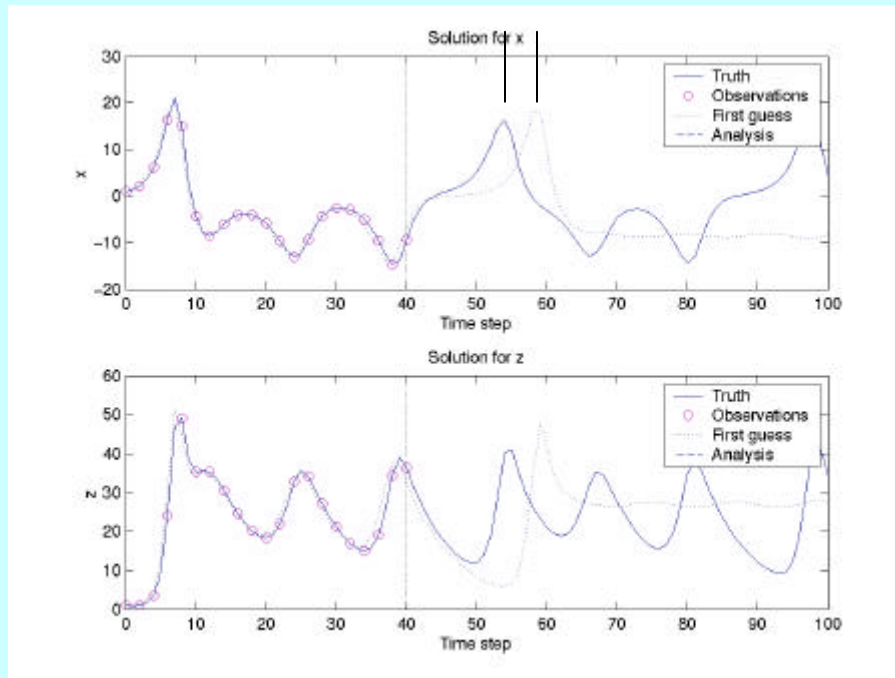
# Full 4D-Var

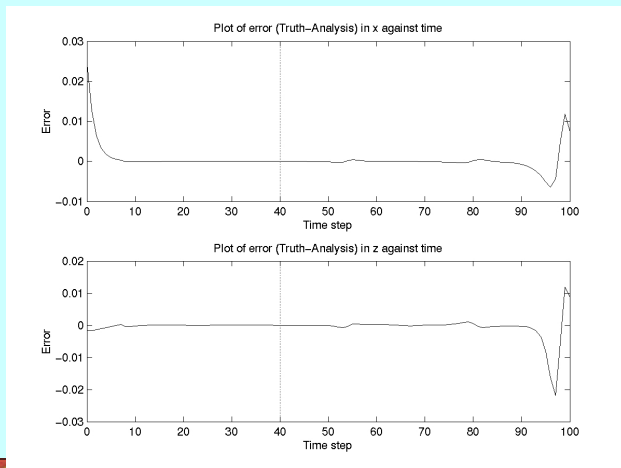
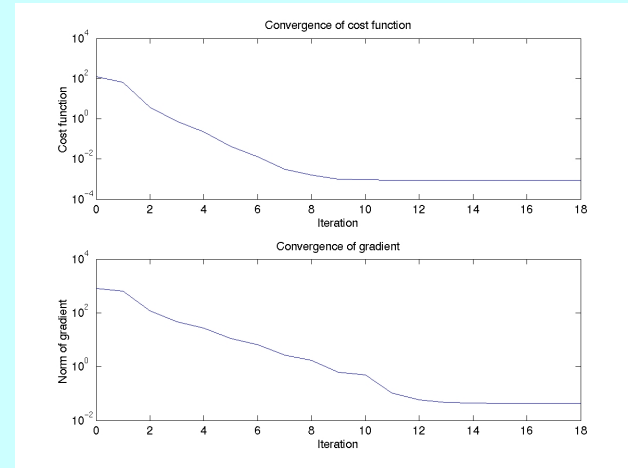
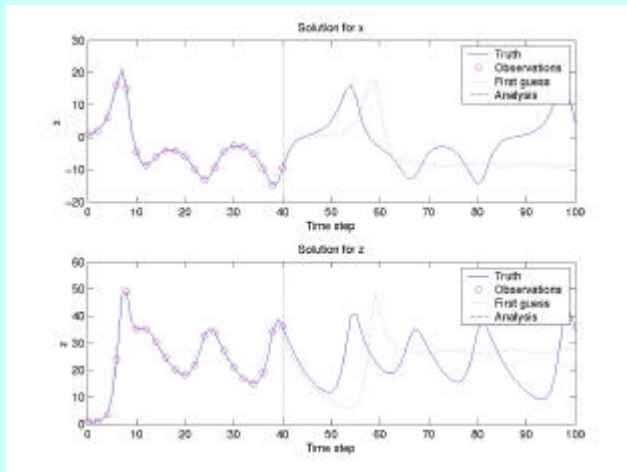


# Incremental 4D-Var



For this case a change of regime occurs towards the start of the forecast and is too late in the background





**List of options chosen**

True (xyz) at t=0: (1,1,1)  
 First guess (xyz) at t=0: (1,2,1,2,1,2)  
 Length of assimilation window: 2  
 Length of subsequent forecast: 3  
 Time step: 0.5  
 Frequency of observations = 2  
 Maximum iterations: 30  
 Tolerance: 1e-5  
 No noise on observations



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